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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,334	01/15/2002	Vishnu K. Agarwal	MI22-1913	7861
21567	7590	12/08/2003	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			HUYNH, YENNHU B	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 12/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/050,334

Applicant(s)

AGARWAL ET AL.

Examiner

Yennhu B Huynh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 16-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 16-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 16,2,5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

This Office Action is in response to the Response filed 9/23/03.

### ***Information Disclosure Statement***

The information disclosure statement filed on 1/15/02, 5/8/02, 3/19/03, 4/2/03 and 9/23/03 are being considered by the examiner.

### ***Specification***

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 16, 17 & 18 are rejected under 35 U.S.C. 102(e) as being anticipated by  
Al Shareef et al. (U.S. 6,281,543B1).

Al-Shareef et al. at figs. 1-7 in related art col. 1-7 disclose a high surface capacitor comprising a double layer electrode, which include:

-Re. claim 16: a surface area enhancement layer 142 over a substrate 126, the enhancement layer having an outer surface area per unit area that is greater than an inner surface area per unit area of the enhancement layer (figs. 8-13); a first capacitor electrode layer 144 (combined by 2 layers: barrier layer 146 and electrode 148) over the enhancement layer, the first electrode having an inner surface area per unit area and an outer surface area per unit area that are both greater than an outer surface area per unit area of the substrate, and the first electrode not comprising the enhancement layer; a capacitor dielectric layer 152 over the first electrode 144 and a second capacitor electrode 154 over the dielectric layer (figs. 12 & 13, cols. 5 & 6, lines 29-64).

-Re. claim 17: wherein the first electrode comprised barrier layer is made of TiN (col.2, lines 44-50).

-Re. claim 18: wherein the enhancement layer comprises rugged polysilicon 142 over the substrate 126, the first electrode being over the rugged polysilicon (col. 5, lines 29-34).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 19-21& 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Shareef et al. (U.S.6, 281,543B1) in view of Rhodes et al. (U.S. 6,291,289B2).

Al-Sharer et al. disclose substantially all of claimed invention, except wherein the rugged polysilicon in undoped polysilicon (cls. 19 & 23).

-Re. claims 19 & 23: Rhodes et al. disclose integrated circuitry capacitor, which include wherein the enhancement layer comprises undoped rugged polysilicon (col.1, lines 27-38 and col. 4, lines 37-41).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Al-Shareef et al. by incorporation the undoped rugged polysilicon to obtain a lesser degree of doping and reduce dopant migration into other substrate structure.

Al-Sharer et al. also do not disclose the polysilicon comprises spaced apart grains (cl. 20),

-Re. claim 20: Rhodes et al. also disclose wherein the rugged polysilicon comprises spaced apart grains for a greater outer surface is showing by a less closely position grains (fig.7).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Al-Shareef et al. by incorporating the rugged polysilicon comprises spaced apart grains, to obtain a greater outer surface.

Al-Sharer and Rhodes et al. also do not disclose wherein the outer surface area of the first electrode is at least 30% greater than the substrate outer surface area (cl.21).

With respect to claim 21, the range of thickness, pressure, energy, dimension or concentration is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller 105 USPQ233, 255 (CCPA 1955). the selection of reaction parameters such as temperature and concentration would have been obvious.

"Normally, it is to expected that a change in temperature, or in range, concentration, cycles, thickness, would be an unpatentable modification. Under some circumstance, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Claims 22 & 24-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Fukuzumi et al. (U.S. 6,222,722).

Fukuzmi et al at figs. 1-40 in col. 1-12 disclose a capacitor having undulated lower electrode, which include:

-Re. claim 22: an opening 22 or 11 in an insulative layer 21 or 10 over substrate 2, the opening having sides and a bottom (figs. 1-4); a HSG polysilicon layer 23 or 12

over the sides of the opening but not over the bottom; a conformal first capacitor electrode 24 or 13, the first electrode being sufficiently thin that the first electrode has a rugged outer surface with an outer surface area per unit area greater than an outer surface area per unit area of the substrate underlying the first electrode ; a capacitor dielectric layer 26 or 14 on the first electrode and a second capacitor electrode layer 27 or 15 over the first dielectric (figs. 20-24, col. 13, lines 46-55 ).

-Re. claim 24: wherein the polysilicon comprises spaced apart grains (fig. 20).

-Re. claim 25: wherein the first electrode comprises barrier layer 17 is made of TiN (col.10, lines 42-65).

-Re. claim 26: wherein the dielectric layer comprises Ta<sub>2</sub>O<sub>5</sub>, ZrO<sub>2</sub>, BST, HfO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> or ST (col.18, lines 14-18).

-Re. claim 27: a surface area enhancement layer comprising undoped rugged polysilicon 51 over a substrate 2, the enhancement layer having an outer surface area per unit area that is greater than an inner surface area per unit area of the enhancement layer; a first electrode layer 52 on an in direct contact with the enhancement layer but not comprising the enhancement layer as part of the first electrode, the first electrode having an inner surface area per unit area and an outer surface area per unit area that are both greater than the inner surface area per unit area of the enhancement layer; a capacitor dielectric layer 53 and an upper capacitor electrode 54 over the dielectric layer (figs. 30-34, col.15 & 16, lines 7-15).

-Re. claim 28: an opening 22 in an insulative layer 21 over substrate 2, the opening having sides and a bottom (fig. 21); a HSG polysilicon layer 23 over the sides

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of the opening but not over the bottom (figs. 20-24, col. 13, lines 46-55); a conformal first capacitor electrode on the polysilicon, the first electrode being sufficiently thin that the first electrode has a rugged outer surface with an outer surface area per unit area greater than an outer surface area per unit area of the substrate underlying the first electrode ; a capacitor dielectric layer 26 and a second capacitor electrode layer 27 over the dielectric (fig.24).

-Re. claim 29: wherein the first electrode also has an inner surface area per unit area that is greater than the surface area per unit area of the sides of the opening area (fig.16, 32 & 34).

### ***Response to Arguments***

Applicant's arguments with respect to claims 16-29 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu B Huynh whose telephone number is 703-308-6110 (and the new telephone number will be effected from 2/5/04). The examiner can normally be reached on 8.30AM-7.00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-



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308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-7724.

Yennhu Huynh  
Examiner  
12/3/03

